SHRP2

STRATEGIC HIGHWAY RESEARCH PROGRAM

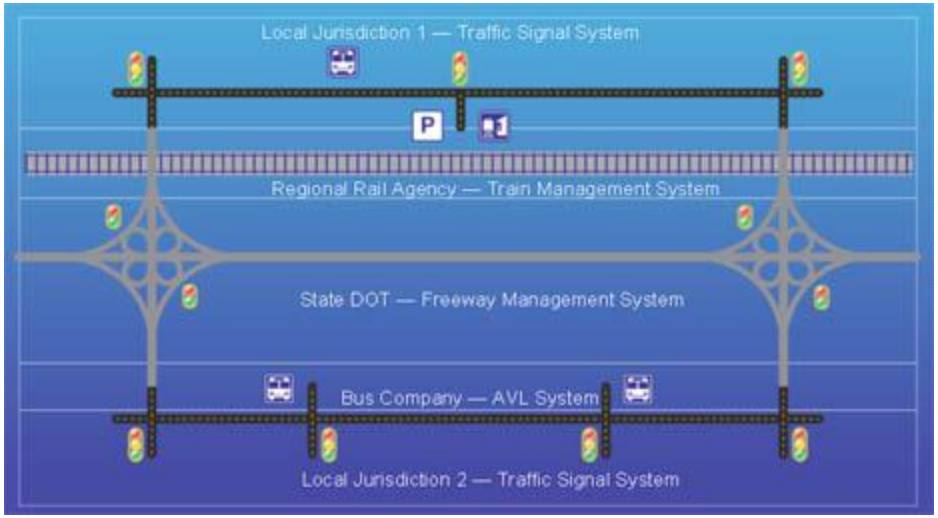
Accelerating solutions for highway safety, renewal, reliability, and capacity

Regional Operations Forum
Managing a Corridor

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

What is a Corridor?

- "A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways and transit route alignments."
  - From "Glossary of Regional Transportation Systems Management and Operations Terms" (TRB Circular)



How Travelers Use a Corridor

- Travelers view the transportation network as a whole
  - Provides them with options
- When faced with congestion on one facility, travelers may respond by
  - Selecting a different facility (transit or roadway),
  - Adjusting their trip to another time of day, or
  - Remaining on their current route
- Should we manage the corridor to reflect how travelers use it?

Corridor Management

- Corridors offer opportunities to operate and optimize the entire system
  - As opposed to the individual networks.
- Transportation corridors often contain unused capacity
  - Parallel routes
  - Non-peak direction
  - Single-occupant vehicles
  - Underutilized transit services
- Managing the corridor can more fully utilize this capacity
  - Management approaches like ramp metering
  - Traveler information and outreach

Corridor Management and TSMO

- TSMO is the collection of activities (incident management teams) and supporting infrastructure (signs, signals, communications) used to ensure that the available supply of roadway capacity is used as efficiently, effectively, and safely as possible
- Corridors are the molecular unit where TSMO activities and infrastructure can be implemented

Corridor management is integral to TSMO

Near Term Actions for Managing a Corridor

From FHWA Corridor Traffic Management website:

- Develop protocols, procedures, operational strategies and control plans
  - ICM
- Deploy traffic control systems
  - ATM and ICM
- Coordinate traffic
  - ICM
- Use managed lane strategies within corridors
  - Managed Lanes

Group Discussion

- How does your agency define a corridor?
- What types of corridor management programs do you have?
- What is the biggest challenge in managing a corridor?

Group Discussion

So you have a proposed connected corridor…

- What is it that you (the region) wants the corridor to address?
- What are the key gaps?
  - Institutional
  - Technical
  - Operational
- What is the timeframe for achieving your (the region's) objectives?
- How does your agency define a corridor?
- What types of corridor management programs are you considering?

Examples of Corridor Management Components and Approaches

- Components:
  - Active Traffic Management (ATM)
  - Managed Lanes
  - Freeway management
  - Arterial management
  - Bus Rapid transit
  - Real-Time Traveler Information

- Approaches:
  - Active Transportation and Demand Management (ATDM)
  - Integrated Corridor Management (ICM)

What is Active Traffic Management?

Traffic management concepts intended to:

- Enhance roadway safety
- Reduce congestion,
  - Variable speed Limits and lanes control primarily non-recurrent
  - Hard shoulder running primarily recurrent
- Provide reliable trips
- Provide enhanced information to motorists
- Provide additional capacity during periods of congestion or incidents

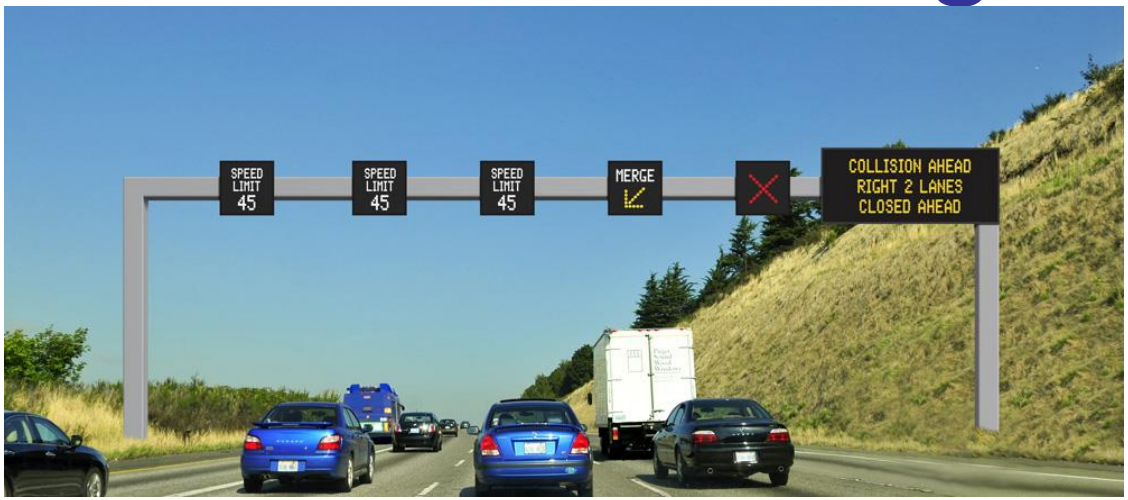
M 42 Speed Harmonization and hard shoulder lane in England. (UK Highways Agency)

Examples of ATM

- Lane-use control
- Variable speed limits / advisories
- Queue warning
- Hard shoulder running
- Dynamic re-routing
- Junction control

Active Traffic Management is not limited to urban areas!

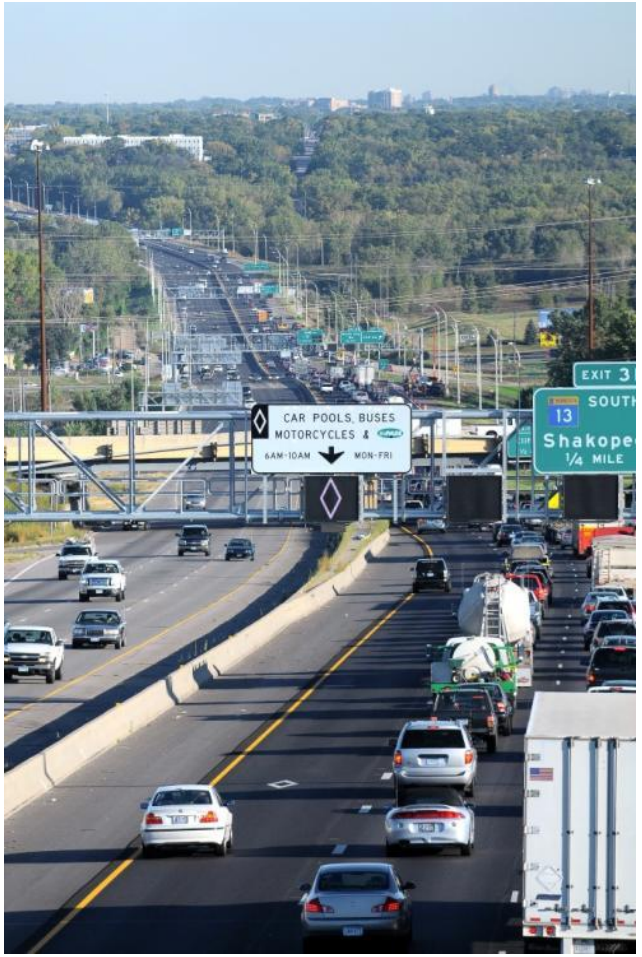
WSDOT's Smarter Highways



- Variable speed limits, lane control, traveler information
- Reduce speeds approaching congestion, crashes, work zones
- Warn motorists of downstream queues
- Display which lanes are open, closed, and closed ahead
- Primary objective is safety improvement

Minneapolis I-35W Intelligent Lane Control Signals

- ILCS located every ½ mile over every lane.
- ILCS are a 4ft x 5ft full color matrix signs.
- Use of the ILCS is primarily for incident management and speed harmonization.
- Designates when the priced dynamic shoulder lane is open or closed along with additional signing.



Variable Speed Displays

- Advisory Only
- Detection measures traffic speeds downstream
- Speeds are posted up to 1 ½ miles upstream

ATM on I-66

- Design-Build project
- Enhances existing I-66 managed lane / hard shoulder running
- Major ATM deployment
  - Hard shoulder running
  - Lane control
  - Speed displays

Los Angeles Junction Control

- NB SR 101 to NB I-5 connector
- High collision experience
- Congestion
- High ramp demand

ATM and Managed Lanes

- ATM is a type of lane management
- Supports other lane management approaches
  - HOT/express toll lanes
  - HOV lanes

Group Discussion

- What other examples of ATM have you heard about?
- What technologies or activities does your agency have that you would consider active traffic management?
- Where you have deployed any of these technologies or systems, what lessons have you learned?

Factors Contributing to ATM Feasibility

- Deployment area characteristics (see next slide)
- Construction activity and opportunity
- Supporting infrastructure
- Data availability
- Cost/benefit estimates
- Transportation priorities, agenda, support
- Institutional policies and issues
- Legislative environment
- Community support and acceptance

Characteristics Indicating Potential ATM Deployment Success

- High traffic volumes
- Changes in prevailing conditions
- High prevalence of crashes
- Bottlenecks
- Adverse weather
- Variability in trip reliability
- Construction impacts
- Financial constraints
- Limitation in capacity expansion

Active Transportation and Demand Management (ATDM)

Broad operational philosophy – an integrated approach for dynamically and pro-actively managing and influencing travel demand and traffic flow

Uses a combination of the real-time operational strategies:

- Those previously noted
- Managed Lanes
- Active Traffic Management
- Integrated Corridor Management
- Dynamic pricing

ATDM Categories

Active Demand Management

- A suite of strategies intended to reduce or redistribute travel demand to alternate modes or routes.
- Examples: comparative multi-modal travel times, dynamic ride-sharing, pricing and incentive approaches.

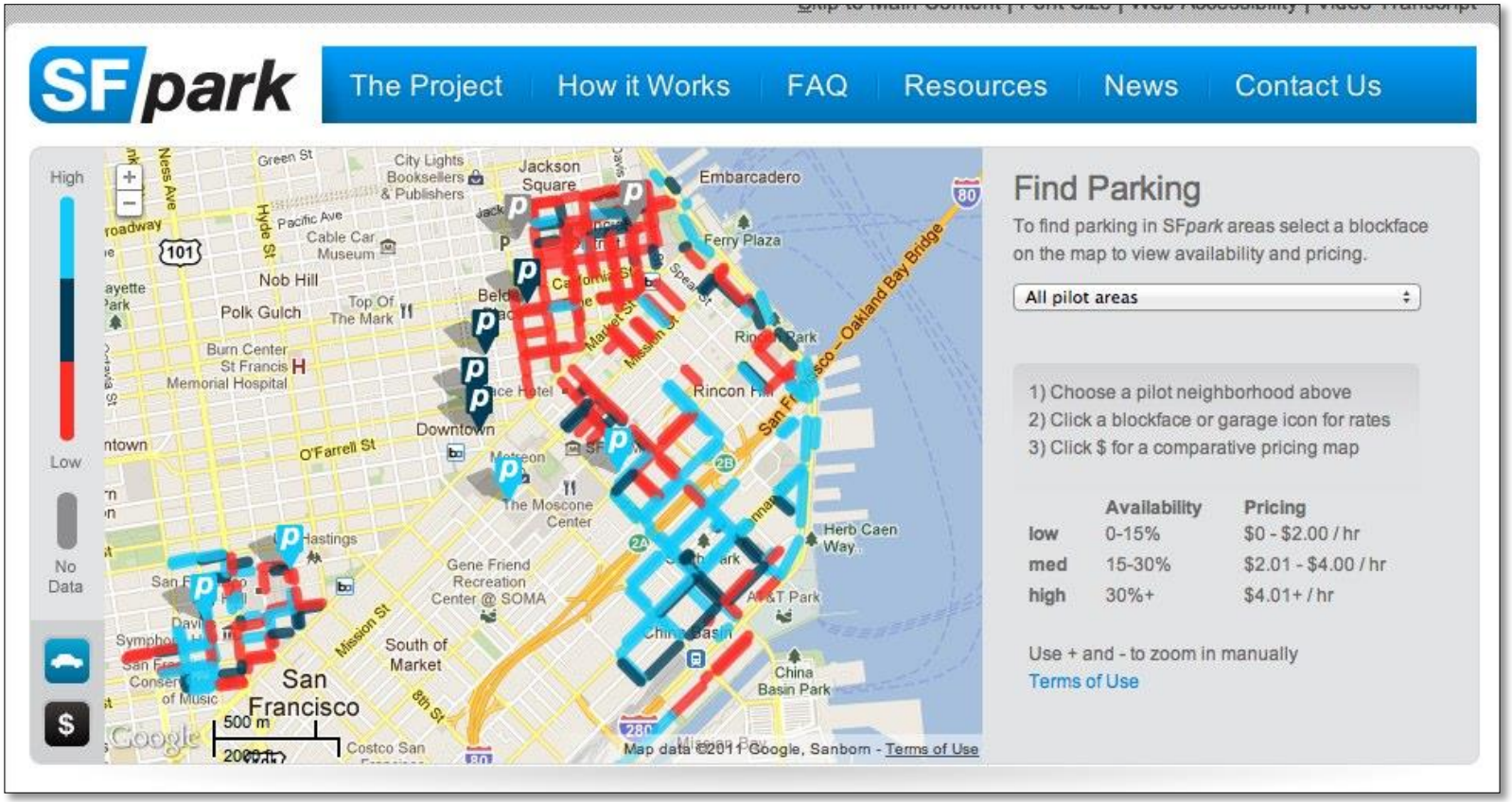
Active Traffic Management

- A suite of strategies that actively manage traffic on a facility.
- Examples: variable speed limits, dynamic shoulder use, queue warning, lane control.

Active Parking Management

- A suite of strategies designed to affect the demand, distribution, availability, and management of parking.
- Examples: parking pricing, real-time parking availability and reservation systems.

Active Parking Management: SF Park



SFPark: Know Where the Parking is Video:
http://youtu.be/9JVepZcA-GI

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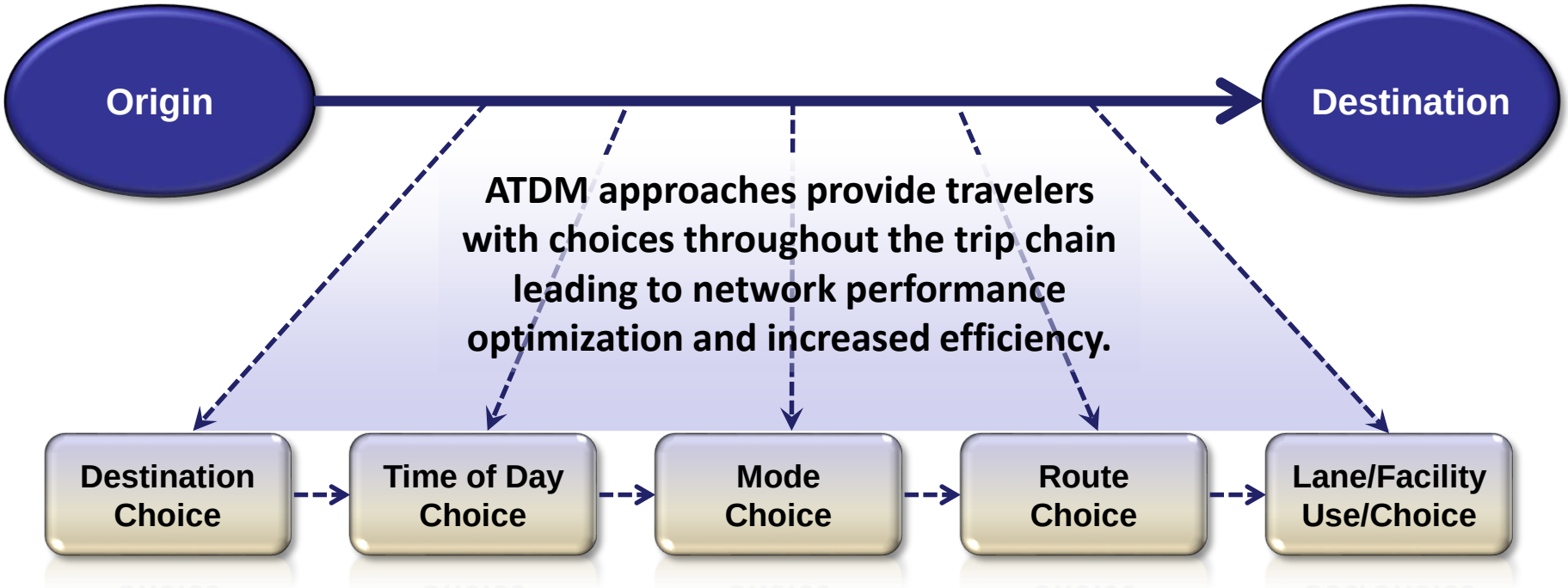
Active Management Throughout the Trip Chain



Key Takeaway: Active management occurs before, during, and at the end of the trip chain

What Are Managed Lanes?

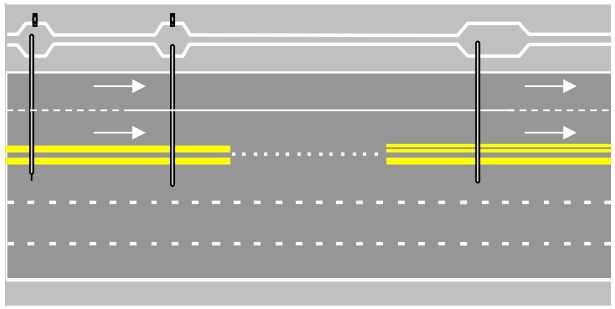
- Preferential lanes or roadways
- Supporting facilities and programs
- Optimize efficiency, performance and throughput
- Offer travel time savings and reliability
- Apply management strategies including
  - vehicle occupancy,
  - vehicle eligibility,
  - pricing, and
  - access control
- HOV lanes were the first widespread managed lanes in the US

What Are the Benefits?

- Greater throughput
- Transit & carpools
- Travel time reliability
- Decreased fuel consumption
- Improved air quality
- Revenue generation

Access Options

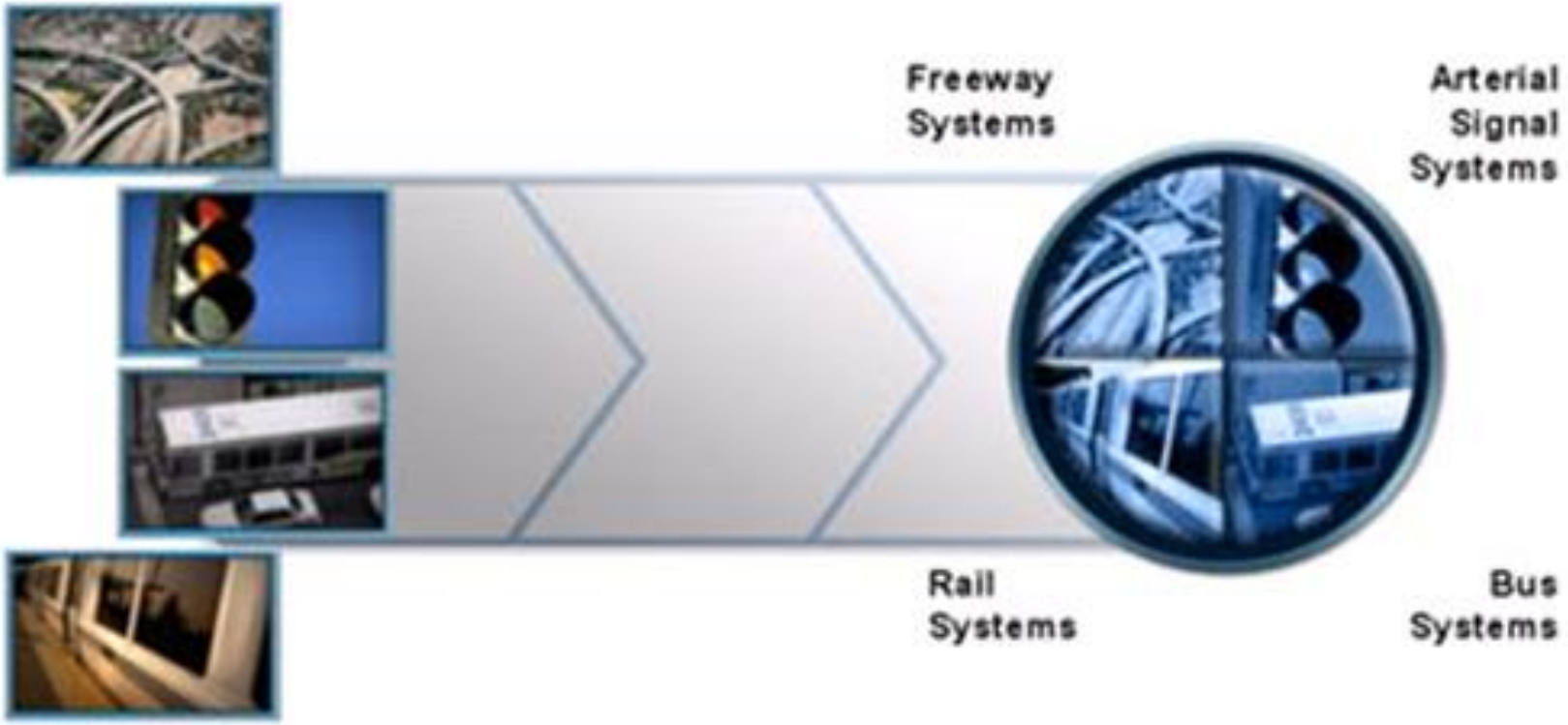
- Open or continuous access
  - Drivers can enter the lane at any location
- Access zones
- Slip ramps
- Direct access ramps



Group Discussion

- Has your agency considered implementing managed lanes?
  - If so, what type?
- How is access controlled?

What is ICM?


Freeway
Systems
Arterial
Signal
Systems
Rail
Systems
Bus
Systems

Integrated Corridor Management

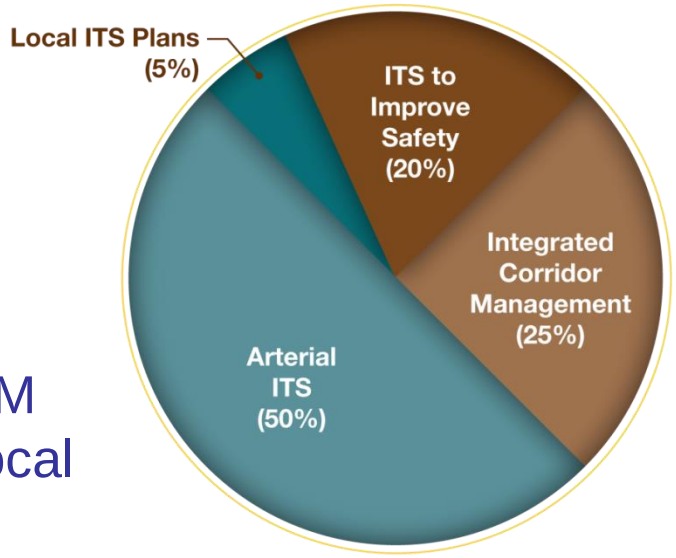
- ICM Background and Concepts
- Status of the Federal ICM Initiative and Sites
- Planning for ICM
  - Stakeholders
  - Integrating with existing plans and programs
  - ICM Concept of Operations
  - Agreements
- Integration to Support ICM Strategies

USDOT ICM Status Update

- San Diego and Dallas went “live” in early 2013
- Testing and evaluating the DSS in both regions
- Independent evaluation
- Early lessons:
  - Agreements are tough. Most challenging part of ICM.
  - Data integration from multiple systems and multiple networks
  - Determining mode shift is difficult, working through how to evaluate effectiveness
  - Combinations of strategies also are challenging to evaluate

Phoenix Area ICM

- Initiated ICM planning during original Pioneer Site applications (not selected)
- Incremental implementation with available regional funds
- MAG 2012 ITS Strategic Plan identified ICM as a regional priority; funding support for local projects that advance ICM goals



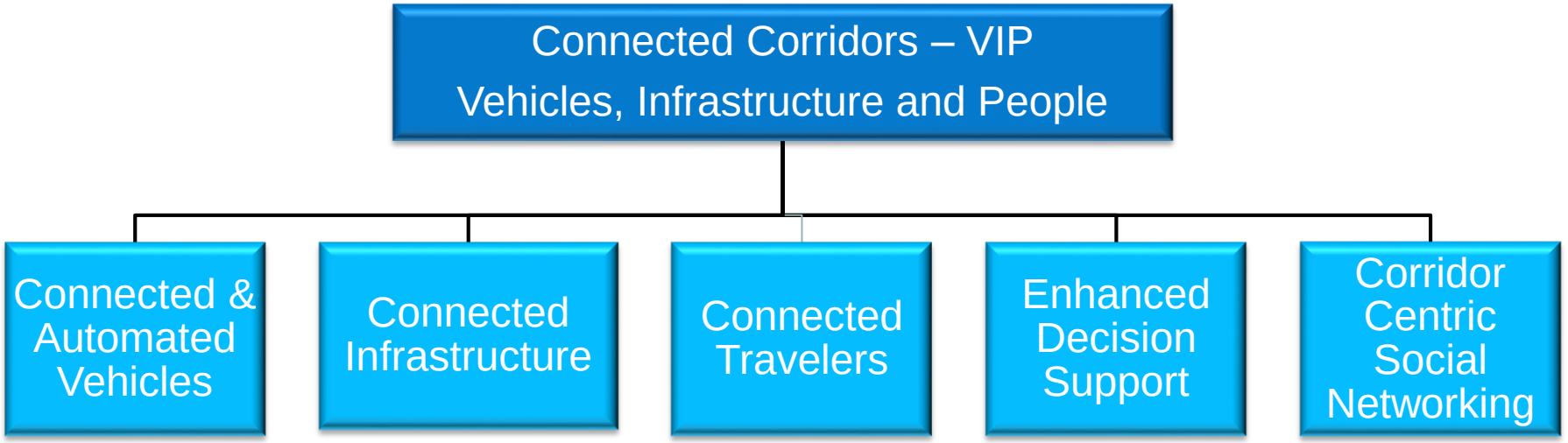
- Combining arterial signal timing improvements and ICM
  - MAG signal timing/coordination projects
- Integrating ICM into a larger corridor master planning effort

AZ Loop 101 ICM

- Arizona DOT, Scottsdale, Maricopa County
- Event-driven ICM – freeway closures
- Positives:
  - Dense arterial ITS Experienced TMC staff
  - Provide arterial alt route
  - REACT to support arterial traffic diversions
- Focus on process improvements
- No new infrastructure

California Connected Corridors

- Initiated in 2011
- Focus on planning, implementation, O&M
  - Coordinate existing infrastructure
  - Deliver improved performance (safety, mobility, reliability)
  - Evolve Caltrans to real-time operations and management
  - Enhance partnerships



Planning for ICM

- ICM Stakeholders and strategies for engagement
- Leveraging existing plans and programs
- Developing a Concept of Operations
- Performance Measures
- Agreements

Engaging Stakeholders in ICM

- Identifying the right partners
- Lead/co-lead
  - Freeway management and operations – TOC, freeway service patrol, freeway incident response
  - Arterial management and operations – TOC, signal operations
  - Transit
  - Incident response and management – freeway and arterial incident response/law enforcement
  - MPO – planning
  - Others to be determined on a regional level based on operational need
- ***Leadership commitment – key to sustaining partnerships***

Strategies for Engagement

- ITS Strategic Plans or Updates
- Traffic Incident Management Coalitions
- Standing Committee Meetings (Operations, ITS)
- Large-scale freeway or arterial improvement projects
- TIP funding cycles
- RTP updates
- Follow up initiatives from RCTOs and other Ops Plans

Plant seeds, build interest, introduce ICM as a collaborative, regional effort

ICM Concept of Operations

- There is a good ICM ConOps format established!!
- IEEE standard for ConOps provides a good go-by
- Key sections should address:
  - Operational objectives, and collaborating on new operational strategies
  - Roles and responsibilities
  - Systems and technology – connectivity among regional partners
  - Gaps – what needs to be addressed, implemented to achieve objectives
  - Timeline
  - Funding requirements and funding sources

ICM Performance Measures

- National evaluation is looking at the following MOEs:
  - Vehicle and person throughput
  - Travel times and travel time index
  - Standard deviation of travel time
  - 80th, 90th, and 95th percentile travel times
  - Buffer and Planning Indices
  - Traveler Response
  - Safety benefits
- Your ICM Objectives
  - Traveler information
  - TIM
  - Data sharing
  - Institutional participation

Demonstration Site Measures

San Diego

- Travel Time
- Delay
- Throughput
- Reliability and Variance of Travel Time
- Safety
- Emissions and Fuel Consumption

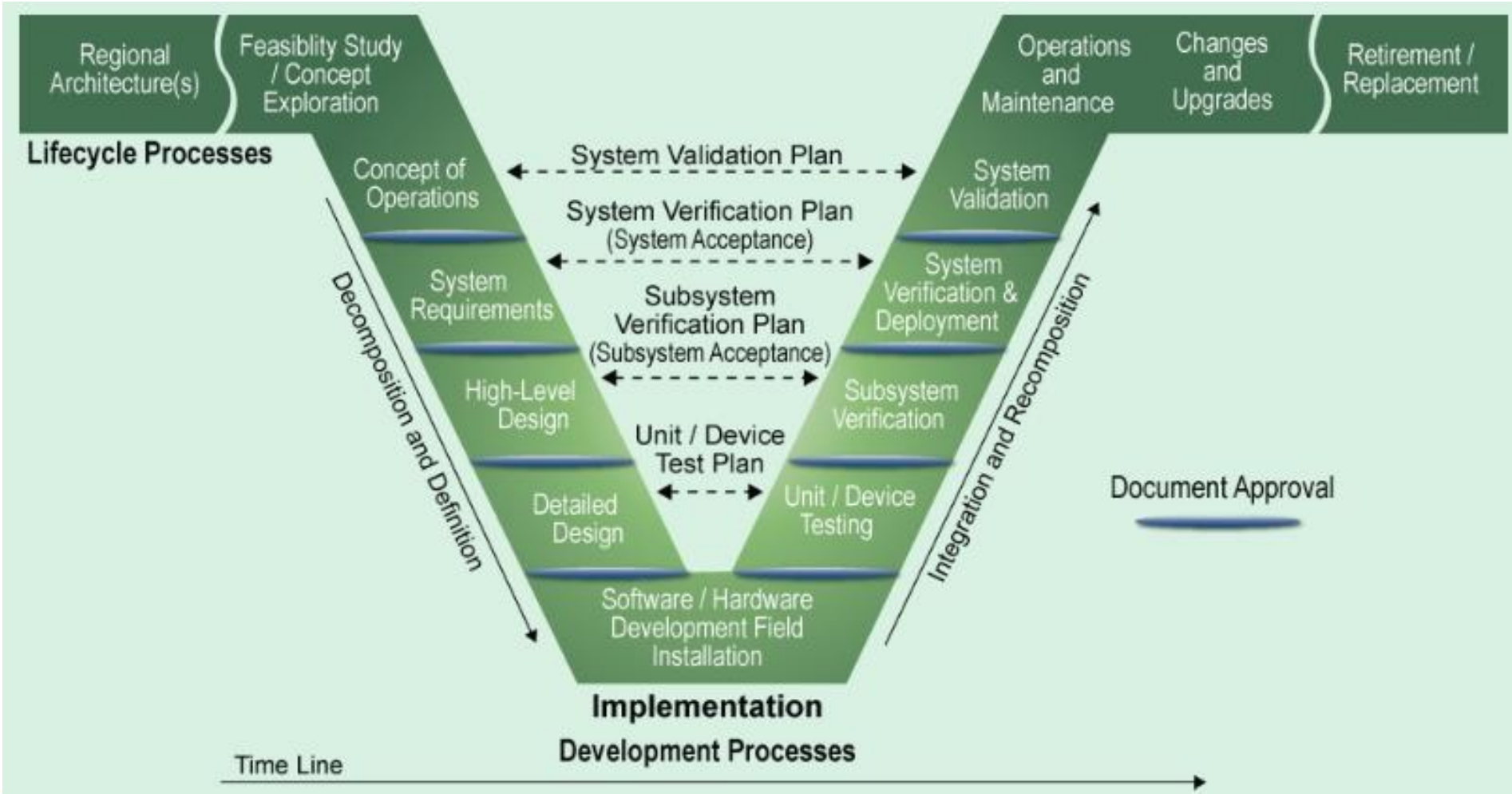
Dallas

- Travel Time Reliability
- Increase Corridor Throughput
- Improve Incident Management
- Enable Intermodal Travel Decisions

Interagency Agreements

- Essential for ICM and multi-agency operations strategies
- New operations models, potential for joint operations
- Data sharing and system connectivity
- Often, the most complex part of an ICM program and strategy
- Examples – I-80, SANDAG, AZ
  - Operating and operating authority
  - Data sharing parameters
  - Cost sharing
  - Decision making

Systems Engineering "V" Diagram



ITS Architecture to Support Project Development

Managing a Corridor Considerations

- What are your initial considerations?
- How would you go about developing a plan for corridor management?
- Who would you involve?
- What technologies/systems/actions would you consider?
- What are the major gaps or challenges you see in implementing the plan?
- What would you do to give your plan the best chance of success, especially considering the gaps/challenges?